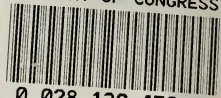


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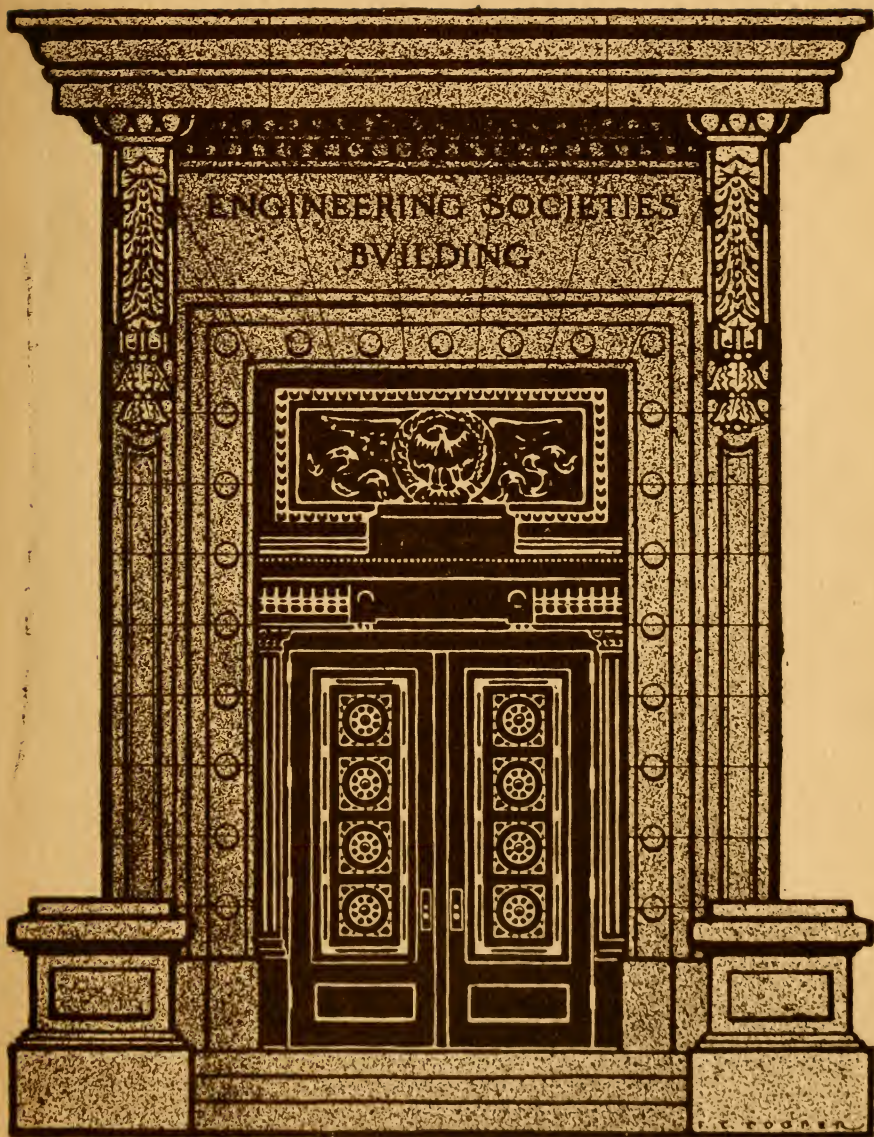
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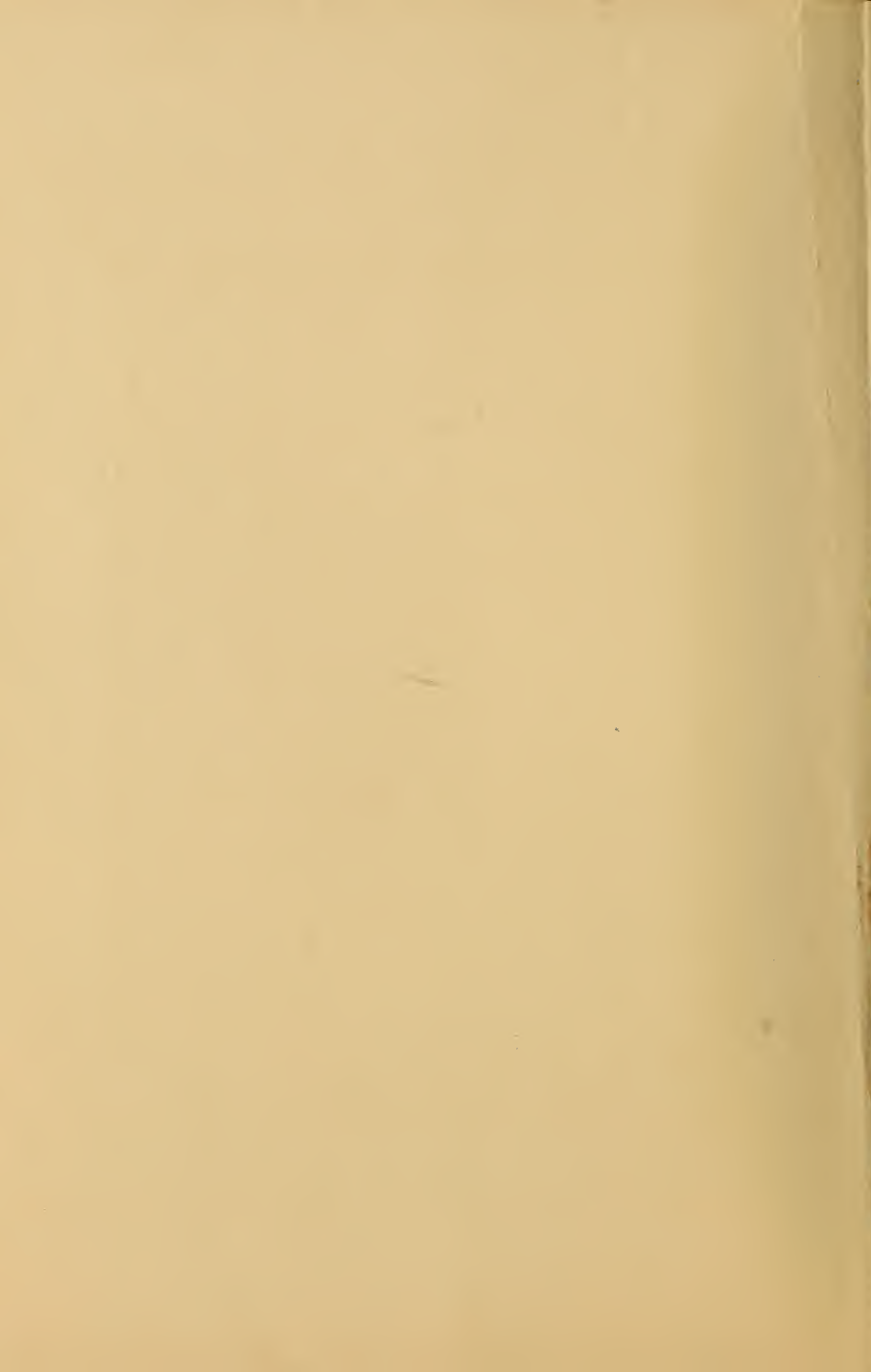


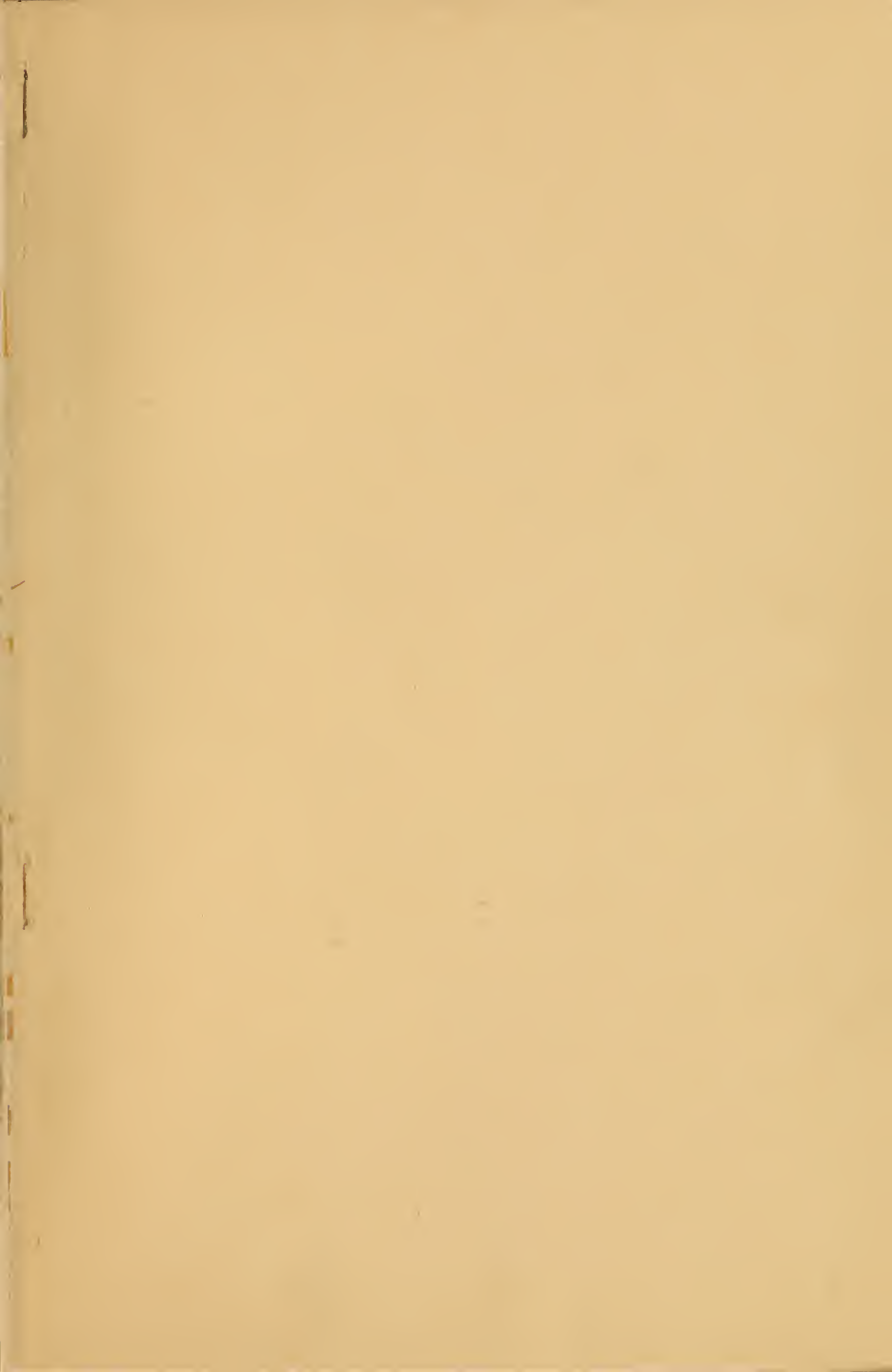
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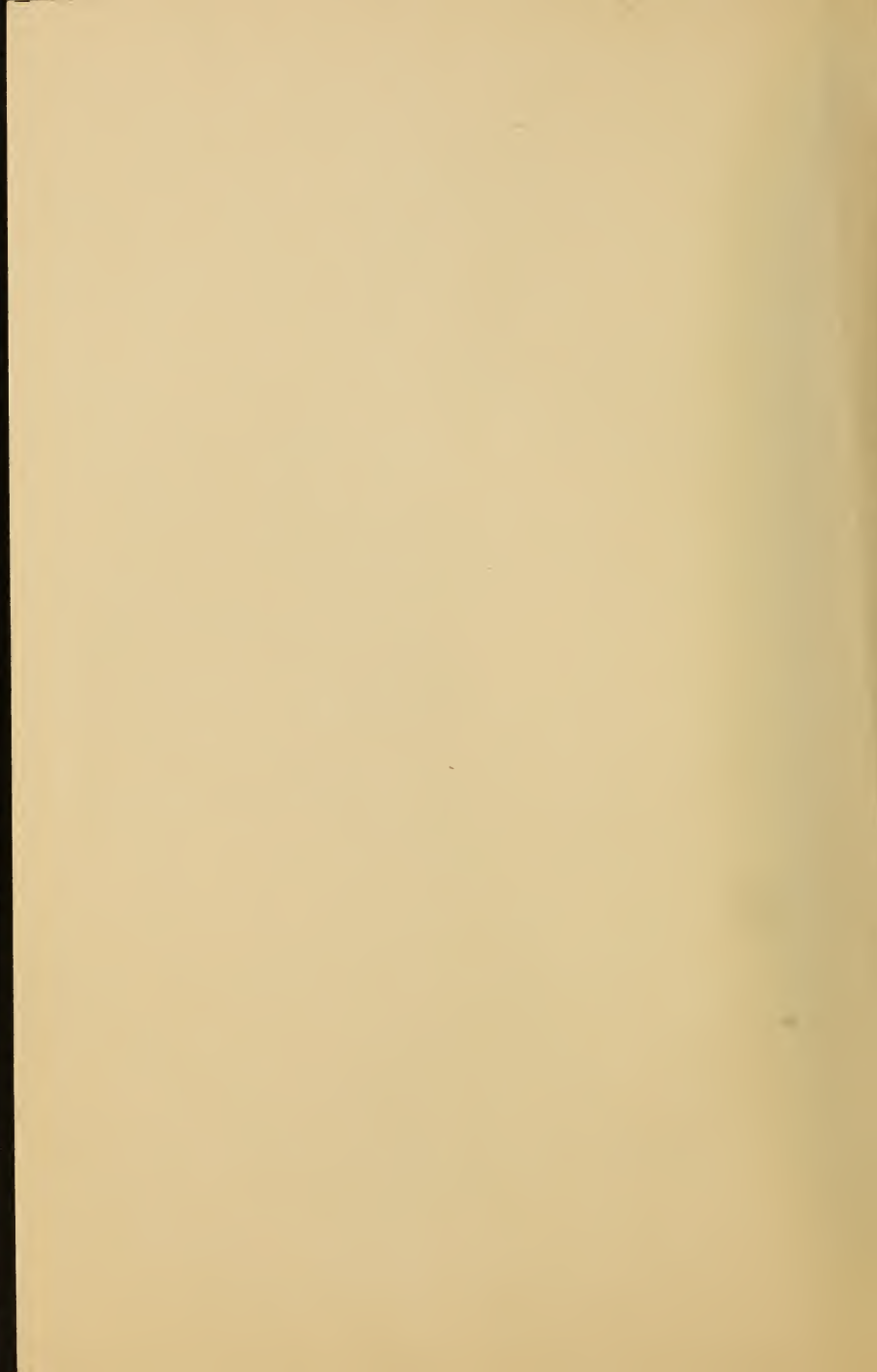


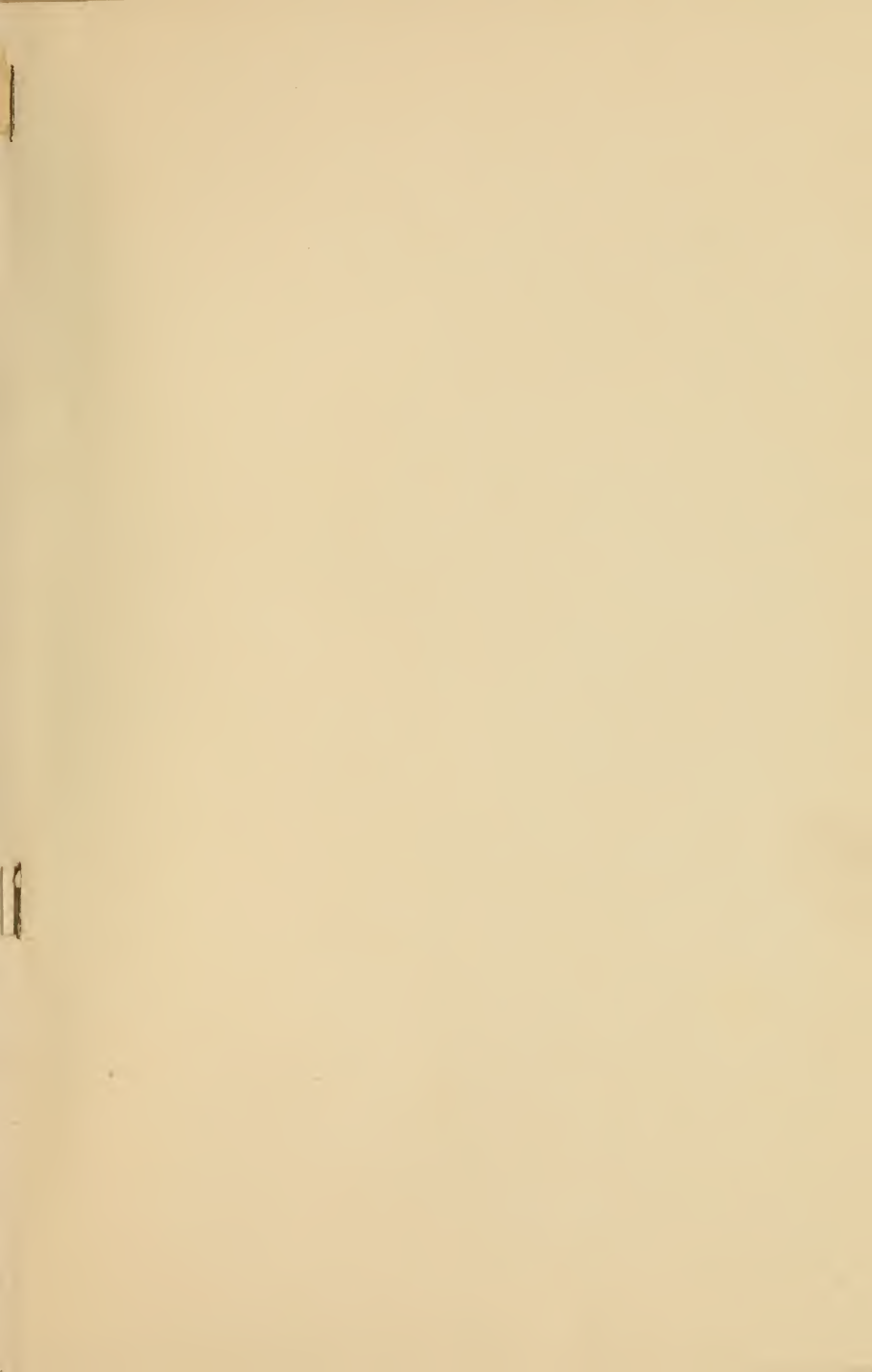
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ENGINEERING SOCIETIES BUILDING
FROM WEST THIRTY-NINTH STREET

Engineering Societies Building

WEST THIRTY-NINTH STREET
NEW YORK CITY

HISTORICAL AND DESCRIPTIVE

Prepared for the Dedication Exercises
April 16-19, 1907



By order of the
Dedication Exercises Committee

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H. H. B. Meyer

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The Engineering Societies Building

Historical

During the past twenty years, the project has been frequently discussed and agitated of bringing together in one building, with proper facilities for offices, library, auditorium, meeting rooms, etc., the various engineering societies that make their headquarters in New York City. References to the idea may be found in various transactions and technical journals as far back as the early eighties, for even then the desirability of such accommodation had already become a topic of conversation among engineers. As a matter of fact, however, the process of society formation was then still quite active, and the tendencies were centrifugal; although with the creation of each new body, the difficulties as to headquarters increased very rapidly. The societies, old and new, all grew apace, acquired valuable property in books, furniture, relics, etc., but in general, had to content themselves with rental of small private houses or rooms therein, subject to loss by fire and to other grave inconveniences.

In 1895, an actual plan for such a joint home was submitted to Mr. Andrew Carnegie by Mr. W. D. Weaver, a member of the American Institute of Electrical Engineers, who received a reply of warm approval and commendation. Others are understood to have made suggestions later of the same nature. In February, 1903, Mr. Carnegie as one of the contributors to the library fund of that Institute, was invited to attend its Library Dinner, and after four declinations on account of inability to arrange a date, accepted. The dinner was given on February 9, at Sherry's, when Mr. Carnegie spoke on co-operation among engineers. The President of the Institute told of its growth and the need of a building for engineering societies. The next day Mr. Carnegie sent for Mr. C. F. Scott, president of the Institute, and Mr. Calvin W. Rice, chairman of its building committee, and discussed with them broadly the idea of a union engineering building. He said that a scheme of that kind should embrace the social as well as the technical interests of engineering. His attention was called to the fact that the Engineers'

Club had just secured land for a new house in West Fortieth street, opposite the new Public Library. The locality appealed to Mr. Carnegie as highly suitable, and on February 14, after conferences in which Messrs. John Fritz, J. C. Kafer, John Thomson and W. A. Redding joined, he wrote a brief letter, saying:

"It will give me great pleasure to give, say, \$1,000,000 to erect a suitable union building for you all, as the same may be needed."

This splendid donation to engineering was followed by a prolonged series of negotiations with respect to participation in it by different bodies, and by formative work and discussions in which a number of engineers of prominence took part in aid of the enterprise. Exactly one year later, March 14, when the plans and estimates showed that a larger sum would probably be required to carry out the work on an adequate basis, for engineering societies in general, Mr. Carnegie in a further letter, addressed to the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, and the Engineers' Club, increased this sum to \$1,500,000 in their joint behalf.

The only limitation on the gift was that it should be devoted to the erection of a building, the bodies interested buying the land. At the outset it was proposed to put up one building on Fortieth street, but owing to the difficulties involved in the purchase of as much land as would be necessary and in combining under the one roof all the social and technical functions exercised by these organizations, it was decided to erect two separate buildings, one for the Club on Fortieth street and one for the professional societies on Thirty-ninth street, the two buildings to be placed in such relationship and contiguity that access from one to the other would be easy and the underlying common purpose thus be subserved to the full extent.

Each of the bodies named in the gift appointed three of its members to form a joint Conference Committee of twelve, whose duty it should be to accept the gift and erect the buildings, and that Committee has remained in active existence up to the moment of the dedication of the Engineering Societies Building. It comprised the following: *American Society of Mechanical Engineers*, C. W. Hunt, J. M. Dodge, F. R. Hutton; *American Institute of Mining Engineers*, A. R. Ledoux, C. Kirchhoff, T. Dwight; *American Institute of Electrical Engineers*, C. F. Scott, C. W. Rice, T. C. Martin; *Engineers' Club*, W. H. Fletcher, J. C. Kafer, W. A. Redding. In organizing for its work this body made Mr. Scott chairman, Prof. Hutton secretary, and Mr. Kafer treasurer. Various changes occurred in the personnel of the Committee from time to time. Dr.



MAIN ENTRANCE TO THE BUILDING.



LOWER FACADE OF ENGINEERING SOCIETIES BUILDING.

Ledoux was succeeded by Mr. E. E. Olcott. Messrs. Rice and Martin were succeeded by Dr. S. S. Wheeler and Mr. Bion J. Arnold; and later Dr. Wheeler gave place to Mr. John W. Lieb, Jr. Mr. Martin succeeded Mr. Redding; while Mr. Kafer, on his death in 1906, was succeeded by Mr. George E. Weed, and Mr. Kirchhoff became treasurer. One of the most important duties of the Committee was the division of the gift in proportion to the requirements and objects of the two buildings. The delicate task was accomplished by allotting \$1,050,000 to the Engineering Societies Buildings, and \$450,000 to the Club Building, by unanimous vote. It will readily be understood that while the nine representatives of the technical bodies and the three of the Club devoted attention to their specific buildings throughout the three years of constructive work, there were a great many questions that required the constant consideration of the Conference Committee as a whole.

The Site

The site acquired for the Engineering Societies Building is on West Thirty-ninth street, north side, between Fifth and Sixth Avenues. The frontage covers five city lots, Nos. 29 to 33, the total front being 125 feet. This land has been bought with money advanced by Mr. Carnegie through Mr. R. A. Franks to the three engineering societies at 4 per cent. interest, the cost being \$540,000, one-third of the amount being payable by each society. To the east of the property, light and air for the building are satisfactorily ensured by the purchase by the Club for its own protection of a large four-story private house of "restricted" height; the Club being in the immediate rear of the Engineering Building.

Selection of Architect

The Conference Committee spent its first year in disposing of the various questions arising in the acquisition of real estate, deciding upon the method of holding title to the property, making arrangements for the administrative details, and determining as nearly as possible the actual requirements of the proposed building. It then became necessary to select an architect. The worldwide fame of the donor, the magnitude of his gift, the national character of the engineering societies, and the great cost of the contemplated edifice, made the selection of an architect a semi-public matter of more than ordinary importance.

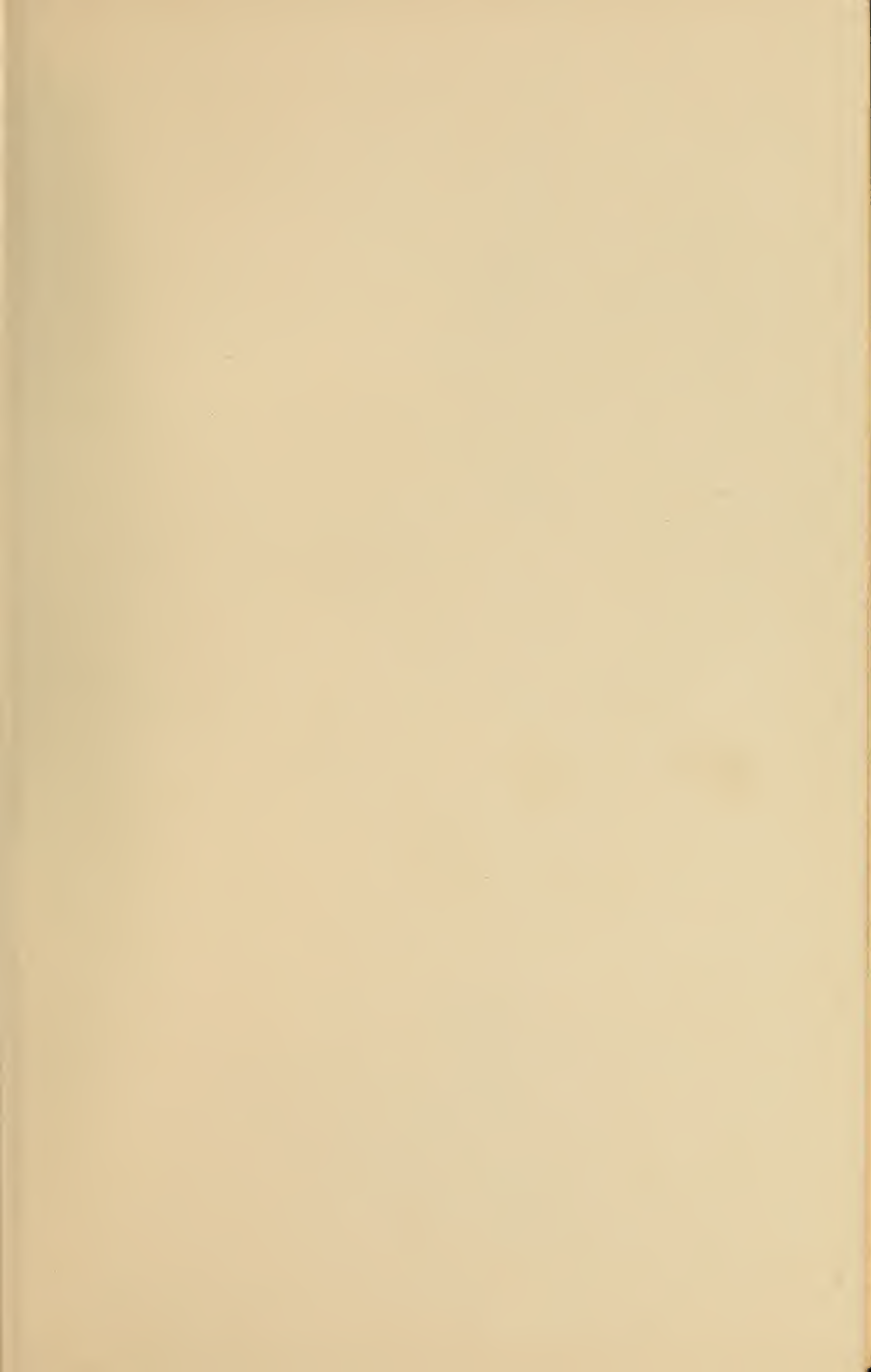
The plan of selection adopted was that of a "mixed competition," in accordance with what was understood to be the wish of Mr.

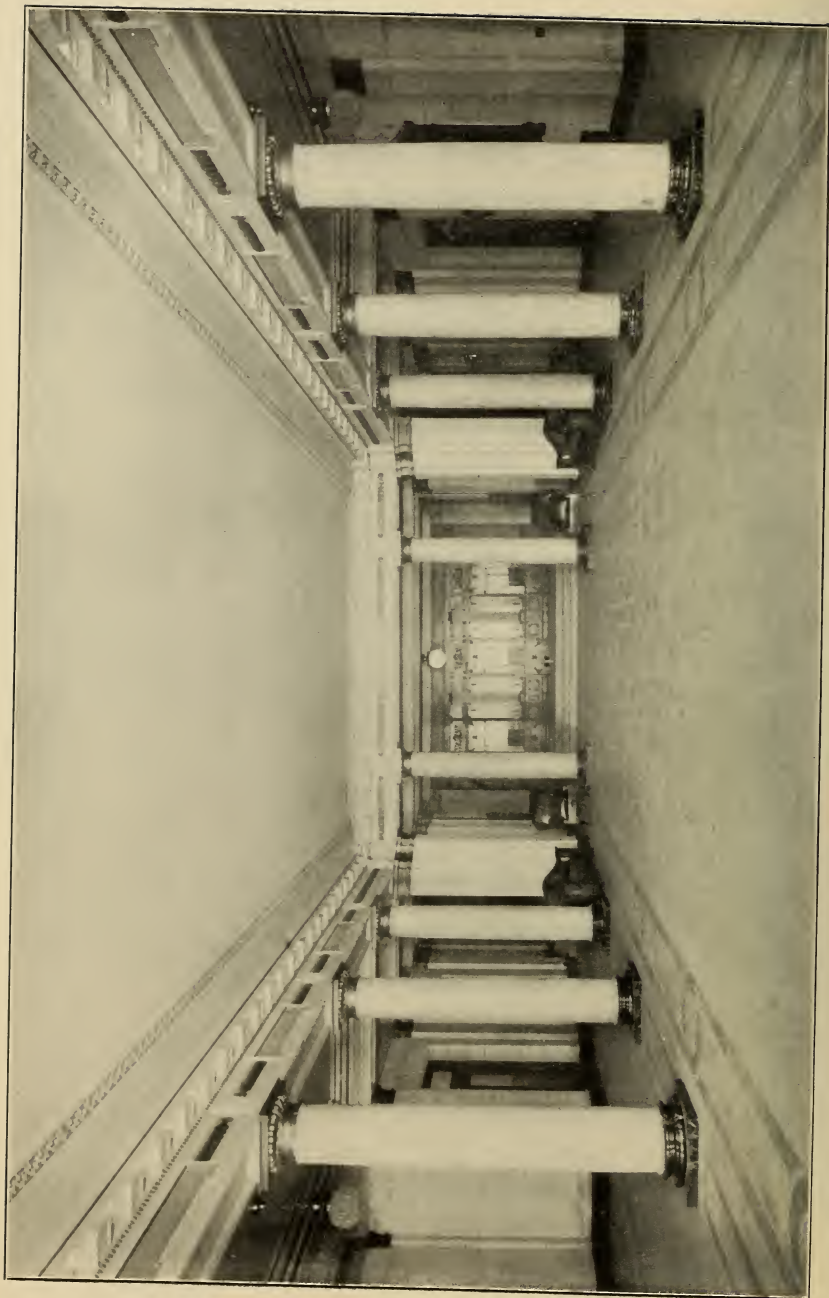
Carnegie. In carrying out this plan, six architects of high reputation were invited to participate. Each of the invited architects was to be paid \$1,000 for submitting his plan, whether it was accepted or not. In addition, other architects were invited to present plans, but without compensation, and the competition was also thrown open to all architects who for two or more years had been in the actual practice of their profession, under their own name. Four prizes of \$400 each were provided for the best of the non-invited architects in the "open" class. All plans were submitted anonymously, and the Committee associated with itself as professional adviser Dr. W. R. Ware, Professor Emeritus of Architecture in Columbia University.

In July, 1904, the Committee made a careful examination of the plans thus submitted, at the rooms of the American Art League, New York City, 26 sets of plans comprising over 500 drawings having been received for the two buildings. The programme called for a handsome but not too ornate treatment of the Engineering Societies Building, the side and rear walls to be reasonably conformable in architectural treatment with the front elevation, so that the edifice might have the aspect and character of a completed structure rather than that of a section of an unfinished block. All drawings were in india ink, on plain white paper without color to a scale of 1/16 inch to a foot, accompanied by a sealed envelope giving his name, and by a general specification as to the plans of the architect. After a very careful study of the numbered sets of plans, it was found that the unanimous choice of the Committee, with the warm approval of the professional adviser, had gone to Messrs. Herbert D. Hale, of Boston, and Henry G. Morse, of New York, associate; who were forthwith appointed the architects for the Building and who as the firm of Hale & Rogers, and H. G. Morse, associate, carried out the work. The award for the Clubhouse was similarly made by the Conference Committee to Messrs. Whitfield & King, of New York.

The Holding Corporation

It was found necessary to organize a holding corporation to administer the endowment and property for the three Founder Societies jointly and in common; and the novel conditions attending the acceptance and utilization of the gift raised many legal and economic problems as to the mutual relationships, duties and rights of the recipients. A corporation was formed by special Charter in the State of New York, in May, 1904, called the United Engineering Society, to act as the trustee for the three founder societies, and its





ENTRANCE HALL OR FOYER,

GROUND FLOOR, ENGINEERING SOCIETY, 1880.

nine trustees are chosen periodically three each by the Councils of the Electrical, Mechanical and Mining Engineers, to control the Building and regulate its finances. The title of the land rests also in this body corporate. The character of the Society, its by-laws, etc., were given most careful thought by the Societies, their legal counsel, the Committee as a whole, and in particular by Dr. S. S. Wheeler, to whom the intricate matter was entrusted as chairman of a sub-committee. The first president of the United Engineering Society was Dr. A. R. Ledoux, who was succeeded by the present incumbent of the office, Mr. E. E. Olcott. The Society took title to the land on which the Building stands, in January, 1905. It may be stated that while the Charter and by laws of the Society have been framed to protect the interests of the three "Founder Societies," under the gift, careful provision is made also for the welfare of the "Associate Societies," *i. e.* the numerous other technical bodies occupying the Building as their headquarters.

General The contract for the construction of the Building was
Data executed with Wells Brothers Company on July 17, 1905. The cornerstone of the building was laid in the eastern wall by Mrs. Andrew Carnegie on May 8, 1906. The time of completion was fixed for November 15, 1906. Offices were ready for occupancy on December 15, 1906; some were in use before the end of the year, and the entire building, though not quite finished, was ready for use January 1, 1907. This remarkable expedition was largely due to the fact that at no time did the architectural plans require important revision. A steel strike in the Spring of 1906 lasted one month and a plaster strike in November about two weeks, but the Building was erected within the specified time and within the appropriated sum, and the relations of the Conference Committee, the architects and the general contractor have been throughout of a most harmonious nature.

The Building The frontage of the Engineering Societies Building on West Thirty-ninth street is 115 feet, and the depth is 90 feet. The property itself is 125 feet front by 100 feet depth. The building laws of the City of New York require that only 85 per cent. of the lot area shall be occupied by the structure on it. Advantage has been taken of this limitation to give the Building a monumental appearance. It is designed in the latest French Renaissance style and rises $13\frac{1}{2}$ stories above the sidewalk to a height of 218 feet $6\frac{1}{2}$ inches. The exterior is built of limestone up to the auditorium floor, and of gray mottled brick and terra cotta above; the whole having a

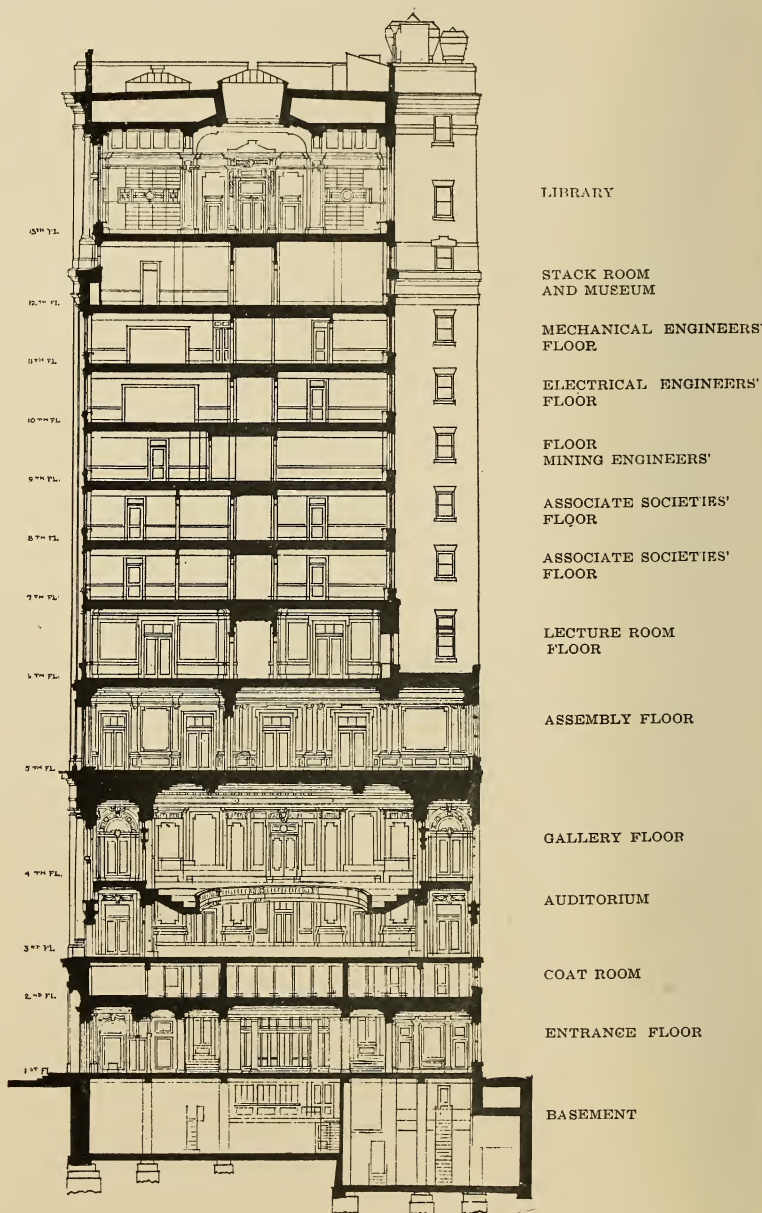
cheerful cream tint on all four sides. The treatment is restrained and dignified, but without severity. As the lower portion is devoted to auditoriums, the middle section to offices, and the upper part to the library, an effort has been made to accentuate these three separate parts of the Building, with a happy result, as shown by the frontispiece engraving.

In excavating the foundations, rock was found at from 27 to 67 feet below the curb line, and there are 46 concrete piers in the foundation going down to solid rock. Two of these piers sustain a load of 3,000,000 pounds each in weight of structure alone, and the steel columns at these two points weigh 1,000 pounds to the vertical foot. The steel plate girders in the ceilings of the main auditorium weigh 48 tons each, and the steel lattice truss on the sixth floor weighs 64 tons. The total weight of steel employed in building construction is 2,650 tons.

All the steel work in the Building has been covered with from 2 to 4 inches of semi-porous terra cotta, and the columns are grouted with concrete. The floors are built with terra cotta 6 inch segmental arch construction, overlaid with 5 inches of cinder concrete. All exterior walls are furred with a 2-inch terra cotta block, to prevent any possibility of moisture being driven through the walls.

Access to the Building is gained by the central entrance on the street level to the first floor; by the western side door leading to the elevators; and by the broad driveway which encircles it completely, so that carriages can enter by the eastern covered arch, set down their occupants at a side entrance and emerge by the western gate. There are three elevator riseways in the main elevator shaft, faced with an iron grill lined with wire glass. On each side of this shaft wide stairways rise to the sixth floor of the building, and one leads thence to the Library floor. A freight elevator has been installed on the eastern side of the Building, and a commodious service stairway on the north side rises the entire height of the edifice. At the first floor, a rear door communicates across the ten-foot areaway, in the open, with the cafe of the Club-house, and on the ninth floor, a flying covered bridge connects with the breakfast room on the tenth floor of the Club.

The woodwork in the Building has been reduced to a minimum. The large windows are built of cast iron, and the other windows of wood covered with kalamined iron, such windows having only a small moulding in place of the usual wide trim and casing. All the doors in the basement, first floor and at the ends of the auditorium promenade are kalamined iron fire doors, and the exit door



SECTIONAL ELEVATION OF BUILDING.

to the Engineers' Club is built of electroplated copper on wood. All the woodwork, including floors, sleepers, trim, etc., has been fire-proofed. The windows up to the height of 100 feet are glazed with wire glass, except on the Thirty-ninth street front, thus bringing the exterior fire hazard down to the lowest possible point. All finished floors throughout the Building are of cement, marble or terrazzo, except the Library, Main Auditorium and lecture rooms, where maple has been used. The insurance rate of 15 cents for this Building is the best proof of its safe construction and solid workmanship. Moreover, additional precaution against fire has been taken by placing an 8,000 gallon tank on the roof, with a stand pipe at each end of the Building, the tank being fed by two electric pumps.

All the walls and ceilings are painted in neutral tints, and the decoration is simple though carefully studied, especially with an idea to later development in the way of mural paintings, the setting of the names of distinguished engineers in plaques, niches for bronze or marble busts, panels for bronze tablets, etc. Opposite the elevator shaft on each of the three Founder Societies floors, the emblem of the society occupying the floor has been executed in a heavy brass plate set into the terrazzo floor. The hardware throughout is in a subdued brass finish, is quite massive and is master-keyed for all doors. The mail chute is ornamental and of the latest pattern. The driveway is defended by handsome wrought-iron gates specially designed, and over the main entrance, a large bronze plaque has been set, bearing the words, "Engineering Societies," to explain the purpose of the Building to passers-by.

Basement and Boiler Room The basement is occupied in part by the boiler room, 22 feet below the curb, and the engine room 16 feet. There is also ample coal storage on the north side, and storage facilities for the various societies, chiefly owing to the fact that it was decided inadvisable to instal an isolated light and power plant. All electrical energy is taken from the mains of the New York Edison Company. The entire basement and boiler room up to the level of the curb have been made thoroughly waterproof, and a sump pit has been installed to avoid any danger from extreme pressure. An ash hoist empties into the driveway.

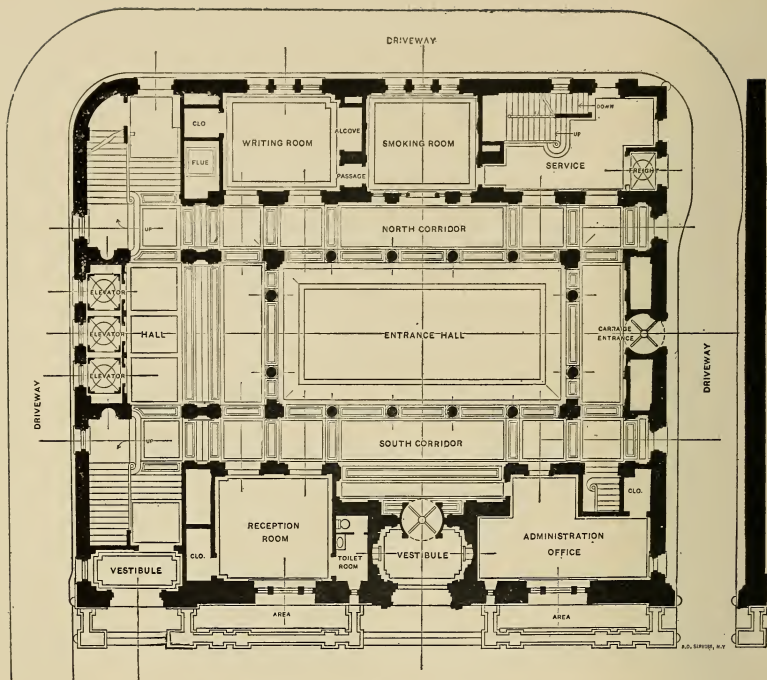
Steam is employed for heating and ventilating purposes, generated at low-pressure by three boilers of the wrought-steel header type, of Babcock & Wilcox manufacture, having an aggregate of 5,226 sq. ft. heating surface. The boilers, as well as the valves, piping and attachments in connection with the boiler plant, are

designed and arranged for high-pressure steam, should it at a later date be desired to instal an electric generating plant.

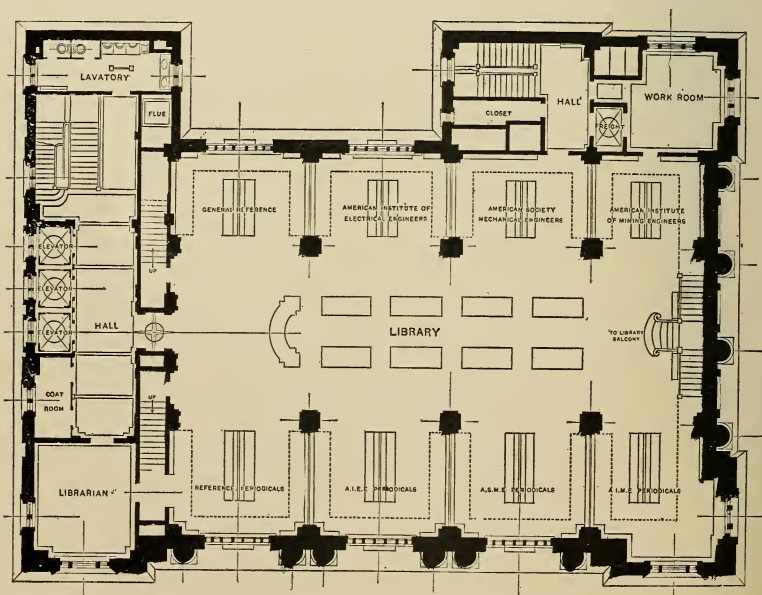
Method of Heating The heating of the Building is accomplished by low-pressure steam circulating through radiators placed underneath the windows. This represents not only the most economical method of heating, but it is the most effective means of counteracting the down-draft from the windows. The radiators in the entire Building are controlled automatically by the Johnson system of heat regulation, so that the rooms will be maintained at a uniform temperature without hand-control, irrespective of outside conditions of wind and weather. No blowers or mechanical means are required for heating the rooms. The extensive blower system installed is for ventilation solely. The ventilation is independent of the heating system, for while in the winter months the Building must be heated twenty-four hours per day, the ventilating system is required only when the halls and rooms are occupied. This separation of heating and ventilating apparatus is, therefore, fraught with economy and simplicity of operation. The Paul vacuum system of steam circulation is utilized in connection with the direct heating, with the tempering coils and with the air moistening apparatus.

Ventilating Plant A thoroughly modern and effective ventilating apparatus is provided for the lower six floors, which contain the large assembly rooms. Pure, fresh air in large quantities is supplied to all the rooms and the main corridors in the lower six floors by means of four electric-driven Sturtevant blowers located in the basement. Air is exhausted from these floors and from the basement, as well as from the toilet rooms, throughout the Building, by means of four electric-driven Blackman exhaust fans located in fan houses on the roof. C. and C. electric motors are installed for driving the blowers and exhaust fans.

One hundred thousand cubic feet of fresh air per minute represents the air supply, when the blowers are all operated at one time. The fresh air after it has passed through the air inlet to the large chamber in the basement, is drawn through the air filters, which free it from dust and the finer mechanical impurities. After the air has been filtered it passes over tempering coils and moistening pans, and is warmed and moistened in the winter months. It goes thence through the blowers, and, by means of the galvanized iron duct system located in the basement, to the



PLAN OF FOYER AND ENTRANCE.



PLAN OF LIBRARY FLOOR.

vertical flues, entering the rooms through registers in the walls and ceilings.

The quantity of air supplied to the individual rooms varies, of course, with the special uses, but in every case a sufficiently large air supply is secured to keep the air pure. Special and unique features were adopted in the Building construction so as to introduce the air into and exhaust it from the rooms by a great number of registers, so that a large volume is introduced at a low velocity, and thus a perfect air distribution is secured. The heating and ventilating plant was installed from the plans and specifications and under the supervision of Mr. Alfred R. Wolff, consulting engineer. It should be noted also that the plans of the halls were submitted to and approved by Prof. W. C. Sabine, of Harvard University as expert on the acoustics of public halls.

The plumbing has all been installed upon the most modern principles of sanitation. All toilet rooms are in marble, and substantial wash bowls are installed in the office rooms. The fixtures are of the best and simplest type. All the water is filtered.

The Electrical System As in the case of the other departments of the Building, the electrical equipment and the illumination had to fulfill unusual and peculiar requirements, owing to the special purpose for which the Building is to be used. In the following brief description, therefore, the usual features of illumination and of the electrical equipment need but be mentioned, while the unusual and somewhat novel feature will be more fully described.

The electrical current supply for the Building is derived from an outside street main service introduced into the Building from the New York Edison Company and the United Electric Light & Power Company, so that both alternating and direct current are available.

The feeders and mains for the lighting system are arranged on the three-wire system, and the two-wire system for power. In all cases, all of the wires of a given circuit are installed in the same conduit, so as to permit alternating current to be used on any circuit in the Building.

As the Building is to be used by different societies, it was essential that the feeder system should be arranged so as to provide means for measuring the current consumption separately in different portions of the Building. For this reason, the feeders were subdivided and the switchboard designed to have meters on each feeder, so as to permit making proper charges for electric current for each

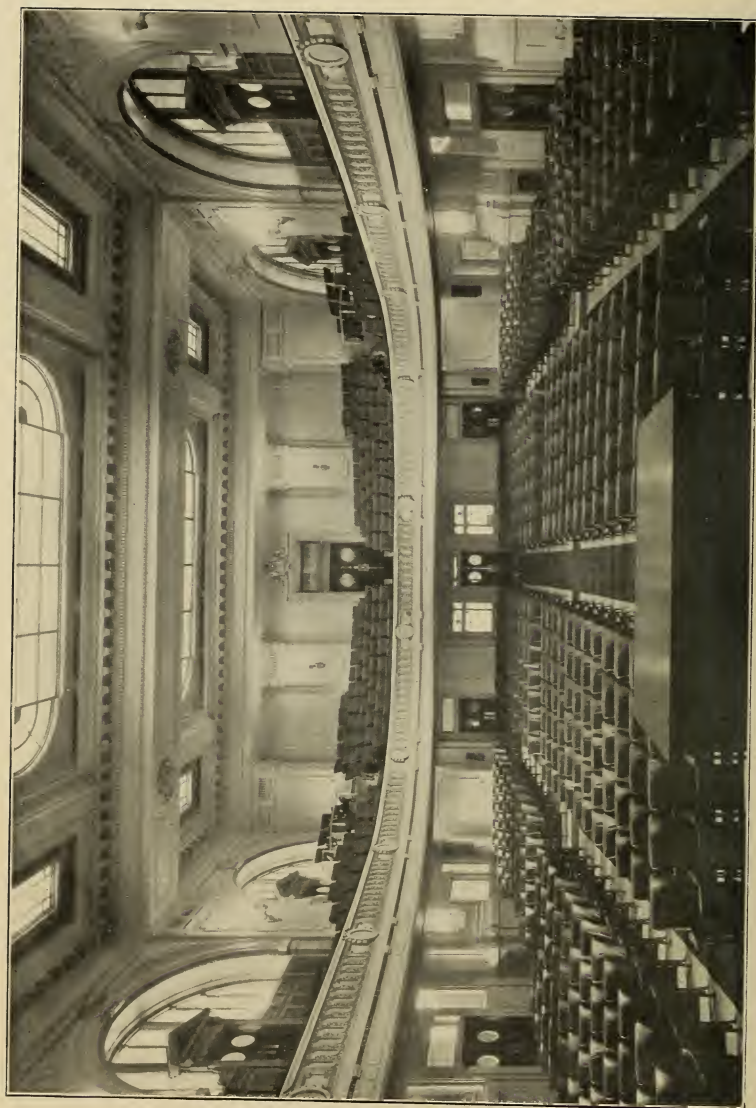
floor; separate feeders, of course, being provided for the entrance halls and corridors.

Two separate feeders from the New York Edison Company have been introduced into the Building, so as to afford additional security in case of failure of one of the service mains. Two separate feeders are provided for the lighting of the main auditorium connecting at the switchboard with the two independent service street feeders, thereby providing duplicate and independent lighting service for the main auditorium, so as to preclude, as far as possible, the liability of interruption of the lighting service of the auditorium. By means of the two-hall feeders, it is possible to light one-third, two-thirds or all of the hall and corridor lights from the switchboard in the basement.

A control switchboard has been provided for the auditorium, in the passageway back of the stage. At this point, the feeders terminate and all of the circuits for the auditorium originate and are controlled. At the upper part of the switchboard, dimmers are provided for the control of the auditorium lighting. At this point also, the special feeders and empty conduits for demonstration purposes terminate. Special outlets have been provided on the stage for musicians' lamps, table lamps, etc. Stage pockets are located in the center of the balcony and in the floor of the center aisle of the main floor, for stereopticon or similar purposes.

Cut-out panels have been provided in each of the assembly and lecture rooms at fifth and sixth floors, so as to provide convenient control of the lights in each room. Special feeders and empty conduits have been provided for demonstration purposes in all of these rooms. Special outlets have been provided in the library for lights on desks, tables, etc., and special circuit work has been done for stack lighting for present and future use. In each office a circuit is run to a corner in the ceiling in each room, and from this point a square of molding is placed eighteen inches from the wall and symmetrically aligning with the room parallelogram. At any point on this molding a small rosette may be inserted and an attachment for a drop light provided.

In order to provide ample current facilities for demonstration purposes, lectures, etc., special feeders have been run from the switchboard in the basement to the auditorium, and to each of the assembly and lecture rooms. The connections of these feeders at the main switchboard in the basement, are such that any desired arrangement or combination of the conductors may be made and, if desired, connections for either direct current, or alternating cur-



THE MAIN AUDITORIUM
LOOKING FROM SPEAKER'S DESK ON PLATFORM.

rent, single phase, two-phase, three-phase, may be quickly and conveniently made.

In addition to the special feeders, empty conduits are run to the auditorium and lecture and assembly rooms, so as to afford raceways for any purpose for which the special feeders would not provide. In the case of the auditorium, two 3-inch conduits run to and terminate in a cabinet at the back of the stage. In the case of the assembly and lecture rooms, a single conduit of $2\frac{1}{2}$ inches internal diameter has been provided.

A complete and flexible interconnection system has been provided for the Building, having its main center in the basement. It affords means for connecting telephones or call circuits in practically every office in the Building. In order to avoid running wires around the picture molding or along the baseboard in the offices, a system was devised by the electrical engineers of having a portion of the base removable, with ample space in the form of a channel extending completely around the room. In order to make this channel continuous, conduits are run under the doors, connecting with the channel space at either side of the door. This channel is connected by means of a conduit, with the nearest interconnection box on the floor.

The Complete specifications were prepared and sketches **Illumination** made by the consulting engineers, acting in co-operation with the architect, for the illumination of every room, and for every fixture in the Building. It was realized by the engineers that the illumination was necessarily only one feature of the Building and must be subordinate to, and in harmony with, the architectural features.

The central space in the entrance hall or foyer is lighted by means of individual lamps, placed in recesses, and concealed by panes of ground glass in the ceiling, at the sides of the rectangle formed by the columns around the large central area. In addition to this, larger crystal balls are provided in the outer corridor beyond the central space and in the elevator hall, entrances, etc. The effect of the individual lights in the recess, screened by glass, is to afford ample illumination without any glare. Crystal glass balls, holding "metalized filament" lamps of various sizes from 50 to 250 watts, are used on the principal floors, from the first to fourth, inclusive.

In the halls above the fourth floor, glass globes have been provided to screen the lamps. These globes, made according to the specifications of the electrical engineers, are unusual in the fact that

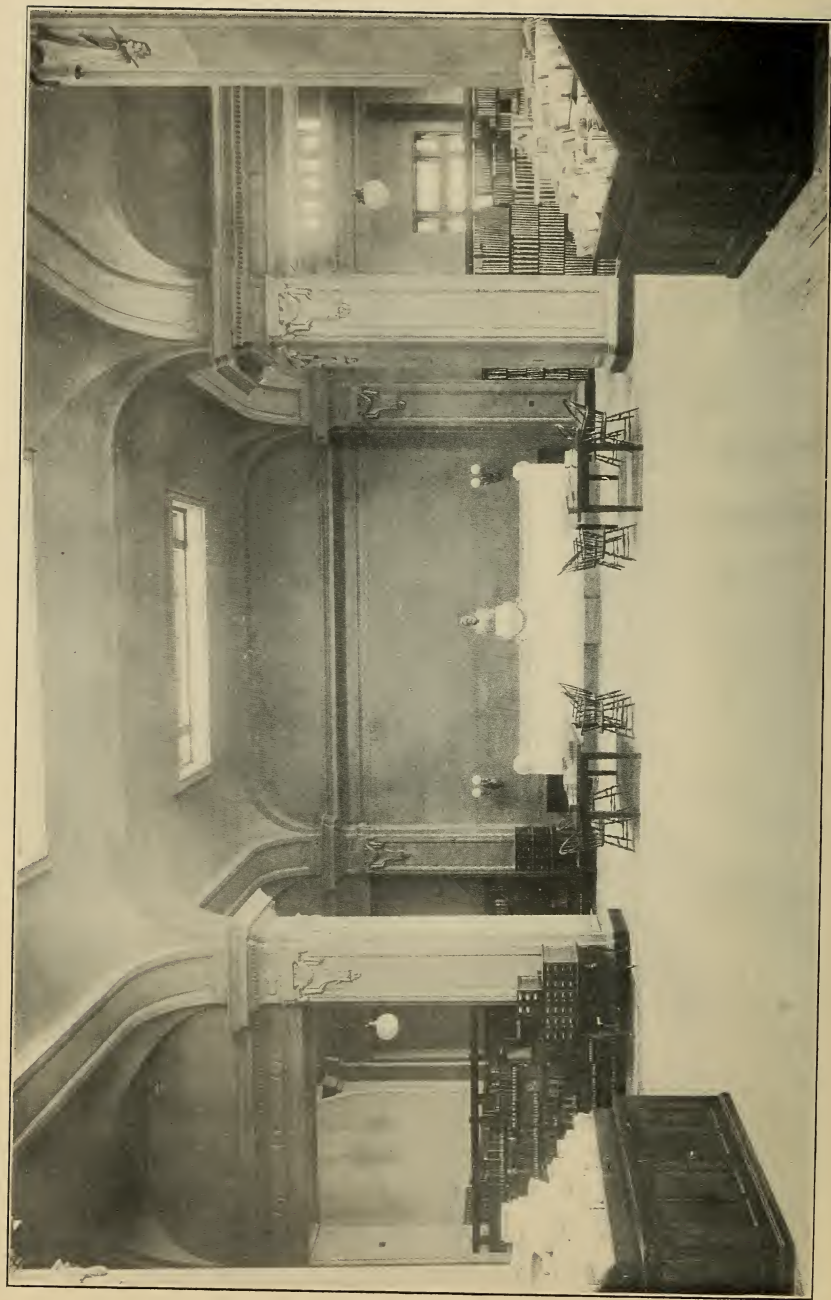
the brilliancy of the lamp is reduced without an excessive loss in the efficiency, and at the same time, a warm, pleasing opal glow is produced.

The lighting of the auditorium is the most effective and probably the most interesting feature of illumination in the Building. The result was obtained by the complete co-operation of the electrical engineers with the architects. At the engineers' suggestion, the architects provided a space of about fifteen inches between the ceiling of the auditorium and the beams of the floor above. At the suggestion of the engineers, also, a glass septum was substituted in place of the proposed plaster panels in the ceiling. The details were then carefully worked out for obtaining access to the lamps for renewal, and tests were made by the engineers to find a glass that would reduce the intrinsic brilliancy or glare, and at the same time would not have an amount of absorption prohibitive on the score of economy. The result obtained has been very satisfactory. The general effect is both soft and pleasing, and resembles or suggests sunlight passing through glass, as at Napoleon's Tomb in the Invalides, in Paris. As a matter of fact, the solid arches of the floor above are within two or three feet of the glass through which the light passes. Additional lighting screened by the same kind of glass is provided at the rear and at the sides under the balcony. Dimmers are provided for reducing the amount of illumination in the auditorium to any desired point, and also for the purpose of gradually increasing the lights to the maximum, after the room has been darkened for a stereopticon, thereby avoiding the unpleasant sensation produced on the retina of the eye, by flooding the room with light immediately following comparative darkness.

The lighting of the assembly and lecture rooms was also designed to prevent the lights from being distracting or unduly noticeable. For this reason, the cove method was adopted, with additional outlets in the ceiling for supplemental fixture lighting. The difficulties of the building construction, did not admit, in all cases, of obtaining continuous coves, or coves of the exact form and dimensions desired. While the cost of lighting by this method is in excess of that using exposed lamps, the fact that the rooms are not in continuous use, but occasionally, for lecture purposes, offsets this objection.

The general illumination of the library is obtained by means of lamps placed above the glass ceiling skylight on a plan similar to that used in the auditorium, the glass in the ceiling skylights being of the same kind as that used in the auditorium ceiling. In addition, ceiling outlets are provided for general illumination, so that the indirect lighting above the glass need be used only at certain times.





VIEW OF LIBRARY AND READING ROOM, LOOKING EASTWARD.

The light for reading is obtained by means of standard fixtures placed upon the tables. The general effect is charming and agreeable.

The specifications and plans for the electrical equipment, the illumination, electric fixtures, etc., were prepared by Messrs. C. O. Mailloux and C. E. Knox.

The Electrical Energy Supply

As noted above, the supply of electrical energy to the Building is furnished from outside and not from an isolated plant. The New York Edison Company reaches the Building by means of two 1,000,000 circ. mil cables; one being a bifurcation of its feeder from East Thirty-ninth street to Thirty-eighth street and Fifth Avenue; and the other being a direct feeder from the West Thirty-ninth street station, near Broadway. There is a 500,000 circ. mil service from the main on the north side of the street and a 350,000 circ. mil service from the main on the south side of the street. In addition there is a United Electric Light and Power Company's service for 60 cycle alternating current.

At the switchboard the installation of the Building is divided into two parts. One feeder and one service from a main supplies one part, and the other feeder and the service from the other main supplies the second part. Either pair of services is sufficient to take care of the whole Building. Double-throw switches are arranged so that ordinarily half of the installation is supplied from each pair of services; but in case of interruption on either pair, the double-throw switch may be thrown so that the full load of the Building can be supplied from the other one.

The Electric Elevators

The elevator shaft for passenger travel occupies the middle part of the western wall of the Building. There are two Otis passenger elevators, 3,100 lbs. maximum load, speed 325 feet per minute with 2,500 lbs. load. One elevator travels from the basement gallery to the fourteenth floor, about 207 feet, and one from the first to the fourteenth, about 196 feet. These are of the latest type, electric drum machines, being equipped with double screws, compound momentum brakes, automatic stop motion switches mounted on the drum shafts for limiting the car travel at either end, hoistway limit switches, slack cable switches and emergency brakes.

The cars are of approximately 33 sq. ft. area and are carried in steel slings or girdles which are fitted with the improved wedge clamp safety device which operates in connection with an Otis governor. This safety device is so constructed as to be made to

grip the guides if a car is descending at undue speed. Each car is counter-balanced with very nearly its own weight, and to the back of each drum is attached a separate weight equal to the average load carried in the car. This arrangement of counter balance gives the most economical results in current consumption.

The elevators are equipped with six $\frac{3}{4}$ -inch standard iron hoisting cables, each; two being for lifting, two for car counterbalance and two for back drum counter-balance. The weight of these cables is compensated by chains attached to the bottom of each car sling and anchored mid-way up the shaft. In addition to the wedge safeties above referred to, these elevators are equipped with the security retarding safety, which acts independently of the other safeties.

The elevators are controlled by means of hand operating switches conveniently located in the cars, and, in case of accident, the current supply to the machine and operating switch can be entirely cut off by the operator, and the emergency brake applied by opening a small switch, known as the safety switch, which is located near the car operating switch above referred to.

The freight elevator, which travels from the basement to the fourteenth floor at the rear of the Building, has a car area of about 24 square feet and maximum lifting capacity of 3,000 lbs.; speed with a load of 2,500 lbs. is 250 feet per minute. This machine, which is also a lifter of safes, is provided with a back gear attachment that can be readily connected or disconnected by the engineer, by means of which the machine can be made to lift 5,000 lbs. at a low rate of speed.

A locking device is also provided for holding the car securely at any floor level while loading or unloading. In all other respects this elevator is similar to the passenger elevators. The plant is operated on the 110 volt direct current circuit.

The Telephone Equipment

Realizing that in a building of this nature the most up-to-date engineering ideas would be embodied in every feature of construction and administration, a careful study was made of the needs of the Founder Societies and the other tenants in the Building with respect to the telephone service, in order that the plant might be adequate and the telephone service thoroughly efficient. Such a study indicated that the most convenient and flexible, as well as the most economical service could be effected by arranging for one switchboard for the entire service throughout the Building from which all of the trunk lines to the



VIEW OF LIBRARY LOOKING TOWARD ENTRANCE.



MAIN AUDITORIUM SHOWING PLATFORM.

central office of the Telephone Company should extend, and in which all the extension telephones in the Building should terminate.

Accordingly, a specially designed single-position switchboard to include all the most modern features, and finished to harmonize with the architecture of the Building has been installed. The switchboard has a capacity of 15 central office lines and 60 extension telephones. This gives the Building a flexible telephone service, since from any telephone at any point in the Building communication may be had with any other telephone in the Building or with any local, suburban or long distance point through the lines of the New York Telephone Company and its sister telephone companies.

Telephones have been installed in the offices of the three Founder Societies, and, in addition, in the engine room, service halls, coat rooms, library, the stack rooms, at the demonstrating tables, to be used by the lecturers, in the janitor's quarters, and at all points of activity, in order that it may be possible to send or receive telephone messages at any point in the Building.

It is estimated that about 12,000 messages per year will be originated from the telephones in this Building, and the contract to cover this number of messages has been arranged for. In addition to the telephones throughout the Building, three booths have been installed on the ground floor in order that visitors to the Building or tenants may send messages from this point.

First Floor The spacious first floor is laid with Tennessee marble tile, having a border in design of colored marble. The central court or main foyer is marked by twelve large columns of Swiss Cipolin marble. A short low flight of steps leads from the foyer to the elevators, and at will a metal grille is thrown across the steps so as to restrict or direct travel. Gold ornament is used sparingly for architectural accentuation, and the wood work is in dark oak. Large chairs and lounges in red leather furnish the foyer, and similar furniture is used in the writing room, smoking room, reception room and administration room, which also contains three telephone booths associated with the "private exchange" system. On the foyer walls, facing toward the main entrance, are two large bronze tablets, one bearing a relief portrait of Mr. Carnegie and the words of his terse letter of gift of \$1,500,000, and the other a statement to the effect that the land was given by members and friends of the three Founder Societies. On this floor also, at the rear, are the receiving and shipping offices through which all freight and goods are handled. In time this floor will be graced with

statuary, but even now it creates a most favorable impression as one enters the Building.

The Main Auditorium Immediately above the first floor is the coat room, laid out on a sectional plan so that several lines of persons may be accommodated at once on entering or leaving. This half floor virtually occupies the space that would otherwise be left blank by the slope of the main auditorium floor just above it.

The Main Auditorium extends up through two floors and with its gallery will seat about 900 persons. The requirements of this chamber were unusual and difficult of definition. It had to be arranged primarily for the general meeting of the Societies, at which the speaking is from the floor as well as from the platform, and at which diagrams, illustrations or blackboard drawings are often employed. This is quite the opposite from the ordinary audience hall, where the stage is the starting point both for the seating arrangements and for the acoustic and optical necessities. Hence the platform is notably small for so large a hall, accommodating few persons, while any speaker in the audience is easily within range of observation.

On both the parterre and the gallery floor, at the sides, the auditorium is surrounded by corridors, rendering access to every point very easy, and permitting ready withdrawal for conversation, committees, etc. The corridors assist also in maintaining quiet within the hall. The platform has ante rooms and is conveniently close to the freight elevator, for delivery of apparatus. There is also a fine stereopticon equipped with connections for moving pictures. The seats are fixed opera chairs in red leather with revolvable tops, and the aisles are laid with red carpet. The gallery front is bordered in red plush. Above the auditorium arch is a decorative cartouche bearing the badges of the three Founder Societies. There are side brackets for lighting, but the main illumination is effected indirectly through the glass ceiling, above which are incandescent lamps controlled from several panel boards. The elevators and stairs open directly upon the two floors of the auditorium which can thus be emptied very quickly in case of emergency. Practical tests of the chamber have already shown it to be a success in every respect of comfort and convenience.

The Lecture Rooms The next two floors above the Main Auditorium are devoted entirely to lecture rooms of which there are no fewer than seven. Two spacious assembly

rooms, 51 feet by 66 feet and 29 feet by 66 feet, occupy the larger part of the fifth floor in such a manner that they can be used independently, or one may be made auxiliary to the other. Two smaller rooms on this floor, 16 feet by 22 feet and 18 feet by 19 feet, can be also used separately or as annexes for reception or conversazione purposes, and provision is made with steam tables, etc., for the service necessary for luncheons or light refreshments. All these rooms are agreeably finished in soft light tints and have facilities for water, air, electric connections, etc., for demonstrations and experiments.

The sixth floor is also divided into lecture rooms, planned somewhat differently, and of smaller dimensions than those on the floor below. The dimensions are respectively 22 feet by 44 feet 6 inches; 30 feet by 46 feet 6 inches; 30 feet by 41 feet and 20 feet by 28 feet. In this manner, the Building affords facilities to audiences of every size from 1,000 down to 100; while on occasion every room can be occupied by sections and sub-divisions of an engineering or scientific congress, with independence and without interference.

The Office Floors The seventh and eighth floors of the Building have been reserved for the Associate Societies that have engineering or some department of science as their principal object. For these organizations the Building affords office areas of varying size, from one room up, with the common facilities of the lecture rooms, library, and other accessories. Among these societies may be enumerated the Society of Naval Architects and Marine Engineers, the Society of Heating and Ventilating Engineers, the National Electric Light Association, the Society of Chemical Engineers, the New York Electrical Society, the Association of Edison Illuminating Companies, the American Street and Interurban Railway Association, etc.

Founder Societies Floors Each of the three Founder Societies occupies a floor laid out in accordance with its own plans. The American Institute of Mining Engineers has the ninth floor, the American Institute of Electrical Engineers has the tenth floor, and the American Society of Mechanical Engineers has the eleventh floor. These floors are all devoted to administrative and executive work, and the libraries of the three societies have been concentrated in the two top floors of the Building.

The Library A crowning detail in the plan of the Building has been the reservation of the twelfth and thirteenth floors for the libraries of the three Founder Societies and of such other collections

of engineering literature as may be added. The twelfth floor below the Library proper has been devoted to the book stacks, but at the present time the main Library is also equipped with one tier of stacks, with provision for a gallery tier later. The stack room is partly equipped with stacks, and in the Library a delivery desk, reading tables and chairs have been provided. The Founder Societies entertain the ambition of creating and maintaining the finest collection of engineering literature in the world, supplemented by the current periodicals, and all the patents relating to invention in the arts and sciences. Provision is being made for special research accommodation, working alcoves, photographic reproduction, drawing and similar library work. Commanding magnificent views of Greater New York and vicinity in every direction, the Library is retired, quiet, free from noise and dust, an ideal haunt of the student and man of research; while open at all times to any reader. In view of the proximity of the New Public Library, the Engineering Societies Building with its unequalled collection of scientific and industrial data becomes at once a vital and important center of the highest value for the diffusion of useful knowledge, and the two Libraries supplement each other.

A bronze bust of Mr. Carnegie, executed especially for the Building by Mrs. E. Cadwalader Guild, a well-known sculptor, from sittings, and presented by the present and past officers of the Founder Societies, stands at the eastern end of the Library, facing toward the main entrance from the elevators.

The Contractors and Sub-Contractors

General contractor, Wells Brothers Company; heating and ventilating, G. A. Suter & Company; electrical work, Western Electric Company; fixtures, Mitchell Vance Company; plumbing, James McCullagh; furniture and carpets, W. & J. Sloane; shades, Simpson-Crawford Company; library furniture, Library Bureau; book stacks, Art Metal Construction Company; auditorium chairs, American Seating Company; lecture room chairs, Readsboro Chair Manufacturing Company; demonstration tables, L. E. Knott Apparatus Company; stereopticon, Charles Beseler Company; stereopticon screen, Journay & Burnham; bronze tablets, J. Massey Rhind, sculptor, and the Roman Bronze Company; steam table, Bramhall, Deane Company. The following is a list of the sub-contractors, etc.: Elevators, Otis Elevator Company; electric pumps, Worthington Pump Company; mill work, Batavia & New York Woodworking Company; or-

The following is a list of the contractors, etc., employed in construction of the Building:

namental iron and bronze work, Winslow Brothers Company; decorations and general painting, W. P. Nelson Company; special metal doors, Dahlstrom Door Company; New York Central Metal Company; Van Kannel Revolving Door Company; ornamental stucco work and plastering, McNulty Brothers; marble and mosaic work; Empire City Marble Company; ornamental brick, Fiske & Company; granite work, Webb Pink Granite Company; tile wainscoting, Frank L. Davis; coffer and roofing work, James White Company; weather strips, Noiseless and Draughtless Door and Window Cushion Company; leather covered doors, Frank Fetzer; filters, Roberts Manufacturing Company; fireproof windows, Manhattan Fireproof Door Company; fireproof doors, Howells & Lawrence; ornamental terra cotta, Conkling-Armstrong T. C. Company and R. Guastavina Company; window and door glass, Benjamin Griffen and Pittsburgh Plate Glass Company; metal latch and furring, A. Oliver & Company; ornamental stone work, James Gillies & Sons; parquette floors, J. B. Shaw & Company; finishing hardware, Yale & Towne Manufacturing Company; fireproof floors, National Fireproofing Company; plumbing fixtures, Henry Huber & Company; mail chutes, Cutler Manufacturing Company.



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